



Environmental impact of recycling nutrients in human excreta to agriculture compared with enhanced wastewater treatment

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Abstract:

Human excreta are potential sources of plant nutrients, but are today usually considered a waste to be disposed of. The requirements on wastewater treatment plants (WWTPs) to remove nitrogen and phosphorus are increasing and to meet these requirements, more energy and chemicals are needed by WWTPs. Separating the nutrient-rich wastewater fractions at source and recycling them to agriculture as fertiliser is an alternative to removing them at the WWTP. This study used life cycle assessment methodology to compare the environmental impact of different scenarios for recycling the nutrients in the human excreta as fertiliser to arable land or removing them in an advanced WWTP. Three scenarios were assessed. In blackwater scenario, blackwater was source-separated and used as fertiliser. In urine scenario, the urine fraction was source-separated and used as fertiliser and the faecal water treated in an advanced WWTP. In NP scenario, chemical fertiliser was used as fertiliser and the toilet water treated in an advanced WWTP. The emissions from the WWTP were the same for all scenarios. This was fulfilled by the enhanced reduction in the WWTP fully removing the nutrients from the excreta that were not source-separated in the NP and urine scenarios. Recycling source-separated wastewater fractions as fertilisers in agriculture proved efficient for conserving energy and decreasing global warming potential (GWP). However, the blackwater and urine scenarios had a higher impact on potential eutrophication and potential acidification than the WWTP-chemical fertiliser scenario, due to large impacts by the ammonia emitted from storage and after spreading of the fertilisers. The cadmium input to the arable soil was very small with urine fertiliser. Source separation and recycling of excreta fractions as fertiliser thus has potential for saving energy and decreasing GWP emissions associated with wastewater management. However, for improved sustainability, the emissions from storage and after spreading of these fertilisers must decrease.

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Resource Description

Communication:

resource focus on research or methods on how to communicate or frame issues on climate change;
 surveys of attitudes, knowledge, beliefs about climate change

A focus of content

Other Communication Audience: Wastewater managers

Exposure : 

Climate Change and Human Health Literature Portal

weather or climate related pathway by which climate change affects health

Unspecified Exposure

Geographic Feature:

resource focuses on specific type of geography

Freshwater

Geographic Location:

resource focuses on specific location

Non-United States

Non-United States: Europe

European Region/Country: European Country

Other European Country : Sweden

Health Impact:

specification of health effect or disease related to climate change exposure

Health Outcome Unspecified

Mitigation/Adaptation:

mitigation or adaptation strategy is a focus of resource

Mitigation

Resource Type:

format or standard characteristic of resource

Research Article

Timescale:

time period studied

Time Scale Unspecified

Vulnerability/Impact Assessment:

resource focus on process of identifying, quantifying, and prioritizing vulnerabilities in a system

A focus of content